

*Air Monitoring
for
Hazardous Air Pollutants
at
25 Sigourney Street
Hartford, Connecticut*

October 24, 2002



*Stephen Arenu
Senior Industrial Hygienist*



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Summary

EnviroMed Services, Inc. (EMS) was retained by State of Connecticut Department of Public Works to conduct an indoor air quality monitoring for hazardous air pollutants at 25 Sigourney Street in Hartford, Connecticut. The purpose of the investigation was to determine if there are elevated levels of specific contaminants entering the building from outside. The sampling was conducted on October 2, 2002 by Marigrace Harkins and Stephen Arena of EMS.

Assessment and Monitoring

The following sampling scheme was devised:

- Sample for airborne concentrations of **respirable dust** using 37 millimeter pre-weighed poly-vinyl chloride filter cassettes in series with 10 millimeter aluminum cyclones attached to monitoring pumps calibrated at approximately 2 liters per minute.
- Sample for airborne concentrations of **formaldehyde** using DNPH tubes attached to monitoring pumps calibrated at approximately 0.3 liters per minute.
- Sample for airborne concentrations of **sulfur dioxide** using 0.45 μ m PTFE filter cassettes in series with treated Anasorb 747 tubes attached to monitoring pumps calibrated at approximately 0.2 liters per minute.
- Sample for airborne concentrations of **nitrogen dioxide** using TEAMS tubes attached to monitoring pumps calibrated at approximately 0.2 liters per minute.
- Sample for airborne concentrations of **ozone** using nitrite coated glass fiber filter cassettes attached to monitoring pumps calibrated at approximately 1 liter per minute.
- Measure for **temperature** and **relative humidity** (RH) to determine the efficiency of the temperature and ventilation process in maintaining static temperatures and humidities based on the solar load, and also thermal load from persons and equipment.
- Test for the presence of **carbon monoxide** (CO).

The sampling for temperature, relative humidity, and carbon monoxide was conducted at four times during the course of the morning using a TSI Q-Trak indoor air quality monitor. The sampling for temperature, relative humidity, and carbon monoxide was conducted in the following locations:

- Fresh Air Intake for the Northwest Roof Top Unit
- Outside Main Entrance
- 17th Floor North Mechanical Room
- 17th Floor North Conference Room 1707
- 17th Floor North Elevator Lobby
- 6th Floor North End
- 6th Floor Elevator Lobby

Sampling for formaldehyde, sulfur dioxide, nitrogen dioxide, and ozone was conducted in all locations, except for the 17th Floor Mechanical Room. Sampling for respirable dust was only conducted in the 17th Floor Mechanical Room and the Fresh Air Intake for the Northwest Roof Top Unit. For respirable dust, formaldehyde, sulfur dioxide, nitrogen dioxide, and ozone, the sampling pumps were turned on and allowed to run for approximately four hours. Once the monitoring was completed, the sampling tubes and filter cassettes were collected and transported to American Industrial Hygiene Association (AIHA) accredited laboratories for analysis.

Results of Monitoring

The following results were obtained from the indoor air quality sampling at 25 Sigourney Street:

- **Respirable Dust.** The concentration of respirable dust at the fresh air intake was 0.021 mg/m³. The concentration in the 17th floor mechanical room was <0.032 mg/m³. There is currently no indoor air quality standard for respirable dust; however, there is a U.S. Environmental Protection Agency (EPA) National Ambient Air Quality Primary Standard for dust and total particulates (NAAQS) of 260 µg/m³ (0.26 mg/m³) for a 24 hour period. The American Conference of Governmental Industrial Hygienists (ACGIH) uses 3 mg/m³ as their threshold limit value (TLV) and the OSHA permissible exposure limit (PEL) is 5 mg/m³ for respirable dust. The concentrations for both sample locations were below all of these levels.
- **Formaldehyde.** The formaldehyde levels inside the building ranged from 0.013 ppm to 0.017 ppm (Table 1). The level outside the main entrance was below the detection limit and the level at the fresh air intake was 0.0079 ppm. There is currently no indoor air quality standard for formaldehyde; however, all concentrations of formaldehyde were below the OSHA PEL for industrial exposure of 0.75 ppm and the National Institute for Occupational Safety and Health (NIOSH) recommended exposure limit (REL) of 0.17 ppm.
- **Sulfur Dioxide.** The sulfur dioxide levels inside the building were below the detection limits (Table 1). The levels outside the main entrance and at the fresh air intake were also below the detection limits. There is currently no indoor air quality standard for sulfur dioxide; however, all concentrations were below the OSHA PEL for industrial exposure of 5 ppm and the National Institute for Occupational Safety and Health (NIOSH) recommended exposure limit (REL) of 2 ppm. The U.S. EPA National Ambient Air Quality Standard for outdoor air is 0.14 ppm averaged over 24 hours.
- **Nitrogen Dioxide.** The nitrogen dioxide levels inside the building ranged from 0.015 ppm to 0.021 ppm (Table 1). The level outside the main entrance was 0.032 ppm and the level at the fresh air intake was 0.034 ppm. There is currently no indoor air quality standard for nitrogen dioxide; however, the OSHA ceiling limit is 5 ppm and the NIOSH short term exposure limit is a 15 minute exposure of 1 ppm. The U.S. EPA National Ambient Air Quality Standard for outdoor air is an annual arithmetic mean concentration of 0.053 ppm.
- **Ozone.** The ozone levels inside and outside the building were below the detection limits (Table 1). There is currently no indoor air quality standard for ozone;

however, all concentrations of ozone were well below the OSHA Permissible Exposure Limit (PEL) for Industrial Exposure 0.1 ppm averaged over eight hours. The U.S. EPA National Ambient Air Quality Standard for outdoor air is 0.08 ppm averaged over eight hours.

- *Temperature and Relative Humidity.* The indoor temperatures ranged from 71°F to 74°F. The relative humidity readings ranged from 45% to 60% (Table 2). In comparing this data to the ASHRAE guideline, the average relative humidity readings were below the recommended range of 30% to 60%. In comparing this data to the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) guidelines for thermal environmental conditions for Human Occupancy (55-1992), it is determined that most temperatures were within the recommended range for summer of 73°F to 79°F. All relative humidity readings were also within the recommended range of 30% to 60%.
- *Carbon Monoxide.* Indoor carbon monoxide concentrations ranged from 1 to 2 parts per million (ppm). The concentrations outside the main entrance and at the fresh air intake also ranged from 1 to 2 ppm (Table 2). All concentrations are well below the Occupational Safety and Health Administration (OSHA) permissible exposure limit (PEL) for industrial exposure of 50 ppm for eight hours. The U.S. EPA National Ambient Air Quality Standard for outdoor air is 9 ppm for eight hours.

Conclusions and Recommendations

Based on the results obtained from the monitoring for hazardous air pollutants, EnviroMed Services, Inc. makes the following conclusions and recommendations:

- Most temperatures were within the ASHRAE guideline. All relative humidity readings were within the ASHRAE guideline of 30% -60%.
- There are currently no established indoor air quality guidelines for respirable dust, formaldehyde, sulfur dioxide, nitrogen dioxide, ozone, and carbon monoxide. However, concentrations for all of these contaminants were below their respective OSHA Permissible Exposure Limits for industrial exposure and the EPA National Ambient Air Quality Standards for outdoor air.

Appendix A
Tables of Results

25 Sigourney Street
Hartford, Connecticut
Indoor Air Quality

Table 1
Results of Air Monitoring
October 2, 2002

Sample Location	Respirable Dust (mg/m ³)	Sulfur Dioxide (ppm)	Ozone (ppm)	Nitrogen Dioxide (ppm)	Formaldehyde (ppm)
Fresh Air Intake for NW Roof Top Unit	0.021	<0.045	0.0048	0.034	0.0079
Outside Main Entrance	---	<0.040	0.0082	0.032	<0.0058
17th Floor North Mechanical Room	<0.032	---	---	---	---
17th Floor North Conference Room 1707	---	<0.039	<0.0031	0.016	0.014
17th Floor North Elevator Lobby	---	<0.041	<0.0039	0.015	0.014
6th Floor North End	---	<0.034	<0.0036	0.021	0.013
6th Floor Elevator Lobby	---	<0.042	<0.0044	0.018	0.017

OSHA PEL	5 mg/m ³	5 ppm	0.1 ppm	5 ppm (ceiling)	0.75 ppm
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25 Sigourney Street
Hartford, Connecticut
Indoor Air Quality

Table 2
Results of Air Monitoring
October 2, 2002

Sample Location	Round*	Temperature (°F)	Relative Humidity (%)	Carbon Monoxide (ppm)
Fresh Air Intake for NW Roof Top Unit	1	70	66	1
	2	70	66	2
	3	73	63	1
	4	75	63	2
Outside Main Entrance	1	72	66	2
	2	73	69	2
	3	75	68	2
	4	76	67	1
17th Floor North Mechanical Room	1	72	60	1
	2	74	58	1
	3	74	59	1
	4	74	56	1
17th Floor North Conference Room 1707	1	71	59	1
	2	73	58	1
	3	73	56	1
	4	73	53	1
17th Floor North Elevator Lobby	1	73	57	1
	2	74	55	1
	3	74	55	1
	4	74	55	1
6th Floor North End	1	71	47	1
	2	73	49	1
	3	73	50	2
	4	74	52	1
6th Floor Elevator Lobby	1	73	45	1
	2	73	47	1
	3	74	48	2
	4	74	50	1

- * Round 1 started at 8:00 a.m.
Round 2 started at 9:00 a.m.
Round 3 started at 9:50 a.m.
Round 4 started at 10:45 a.m.

Appendix B
Laboratory Results

OCT 17 '02 07:28AM EHL
LABORATORY ANALYSIS REPORT

Environmental Health Laboratory
 100 Scherke Drive, Suite A-5
 Cromwell, CT 06416
 (800) 243-4903 or (860) 635-6475



State of Connecticut Approval #PH 0510
 Lab Accreditation: AHA #144, AHA ELLAP #6945

To: Marigrace Harkins
 Enviromed Services, Inc.
 470 Murdock Avenue Box 13
 Meriden, CT 06450

Report #: C0210938

P.O. No.: 25 Sigourney St., Hartford, CT
 Sigourney St.

Date Received: 10/2/2002

Date Reported: 10/14/2002

Page 1 of 2

Analysis: Respirable Particulates
 Analytical Method: Gravimetric; NIOSH #0600

Sample Number	Air Volume (Liters)	Component	ug	Concentration	Units
45744	522	Respirable Particulates	11.0	0.021	mg/m ³
45742	308	Respirable Particulates	<10.0	<0.032	mg/m ³
45796 BLK	---	Respirable Particulates	0	---	---

All analytical results have been corrected for the blank. The blank had a 22 ug weight loss.
 Concentrations reported are based on air volumes provided.

Analysis: Nitrogen Dioxide
 Analytical Method: Colorimetric; NIOSH 6014

Sample Number	Air Volume (liters)	mg NO ₂ / m ³	ppm NO ₂
N1	26.6	0.063	0.034
N2	47.4	0.031	0.016
N3	48.3	0.029	0.015
N4	43.4	0.061	0.032
N5	42.9	0.039	0.021
N6	42.8	0.033	0.018
N7 Blk	---	<0.95 ug	---

The detection limit for this NO₂ method is 0.95 ug.

Concentrations reported are based on air volumes provided.

Analyst: Shawn Nevico and John Martello

Date: 10/14/2002

Analysis: Ozone

Analytical Method: Ion Chromatography; OSHA ID #214

Sample Number	Air Volume (Liters)	Component	ug	mg/m ³	ppm
344	286	Ozone	2.69	0.0094	0.0048
339	316	Ozone	<1.94	<0.0061	<0.0031
348	253	Ozone	<1.94	<0.0077	<0.0039
340	312	Ozone	5.02	0.016	0.0082
350	276	Ozone	<1.94	<0.0070	<0.0036
347	222	Ozone	<1.94	<0.0087	<0.0044
345 Blk	---	Ozone	<1.94	---	---

The detection limit for this method is 1.94 ug ozone.

Analysis: Sulfur Dioxide

Analytical Method: Ion Chromatography; Modified OSHA ID 200

Sample Number	Air Volume (Liters)	Component	ug	mg/m ³	ppm
S1	35.6	Sulfur Dioxide	<4.17	<0.12	<0.045
S2	40.5	Sulfur Dioxide	<4.17	<0.10	<0.039
S3	38.7	Sulfur Dioxide	<4.17	<0.11	<0.041
S4	40.1	Sulfur Dioxide	<4.17	<0.10	<0.040
S5	47.4	Sulfur Dioxide	<4.17	<0.088	<0.034
S6	38.0	Sulfur Dioxide	<4.17	<0.11	<0.042
S7 Blk	---	Sulfur Dioxide	<4.17	---	---

The detection limit for Sulfur Dioxide is 4.17 ug.

Samples analyzed by ion chromatography are quantitated by matching the retention times of sample peaks with those of known compounds. A matching retention time is not proof of chemical identity. Concentrations reported are based on air volumes provided.

Analysis: Formaldehyde

Analytical Method: HPLC; NIOSH 2016

Sample Number	Air Volume (liters)	Component	ug	mg/m ³	ppm
F1	84.2	Formaldehyde	0.816	0.0097	0.0079
F2	104	Formaldehyde	1.83	0.018	0.014
F3	67.4	Formaldehyde	1.16	0.017	0.014
F4	70.5	Formaldehyde	<0.500	<0.0071	<0.0058
F5	87.4	Formaldehyde	1.35	0.015	0.013
F6	68.6	Formaldehyde	1.42	0.021	0.017
F7 Blank	---	Formaldehyde	<0.500	---	---

The detection limit for this method is 0.50 ug.

Samples analyzed by liquid chromatography are quantitated by the matching retention times of sample peaks with those of known compounds. A matching retention time is not proof of chemical identity. Concentrations reported are based on air volumes provided.

Analyst: John Martello and Ben Miller

Date: 10/14/2002

WHO - 175 ppm
 24-hr
 annual mean 50 ug/m³
 EPA standard
 annual mean
 1.03 ppm

Send INVOICE To (REQUIRED)	Send RESULTS To (REQUIRED)	
Name: Accounting Dept.	Name: Marjorie Hartins	
Company:	Company: EnviroMed Services, Inc.	
Mailing Address:	Mailing Address: 470 Murdock Ave.	
City, State, Zip:	City, State, Zip: Meriden CT 06450	
PO#, Ref # (If Required):	Phone No: (803) 238-4846	<input type="checkbox"/> Phone Results
Accts. Payable Phone No:	Fax No: (203) 238-4243	<input checked="" type="checkbox"/> Fax Results
Accts. Payable Fax No:	Email:	<input type="checkbox"/> Email Results
Sampling Location: 25 Sigmourney St. Hartford, CT	Sampling Media:	
Product Manufactured/Service Rendered:	Sampling Method:	

CHAIN OF CUSTODY	Collected by (print): <u>M. Hawkins / S. Arena</u>	Collector's Signature: <u>M. Hawkins</u>	
	Relinquished by:	Date/Time	Received by:
	Relinquished by:	Date/Time	Received by:
	Method of Shipment:		Received at Lab by: <u>Sarah E. Hume</u>

Authorized by: _____ Date: _____
(signature required)

Sample Condition Upon Receipt ☒ Acceptable ☐ Unacceptable

[illegible]

FOR LAB NOTES ONLY:

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Page
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pg. 2 of 3

Environmental Health LaboratoryEHS Risk Control Services
One of the ACE Group of Companies100 Sebeth Drive Suite A-5
Cromwell, CT 06416
(860) 635-6475 (800) 243-4903 FAX (860) 635-6750**REQUEST FOR ANALYTICAL SERVICES**

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for Rush analysis.
Additional charges
apply.

70-202

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Lab Report No.

C0210938

☐ Und ☐ SRF ☐ AR
☐ ESIS ☐ IZ ☐ Claims

Pol. Of Con. No.

Send INVOICE To (REQUIRED)

Send RESULTS To (REQUIRED)

Name: Accounting Dept

Company:

Mailing Address:

City, State, Zip:

PO#, Ref # (If Required):

Accts. Payable Phone No:

Accts. Payable Fax No:

Sampling Location: 25 Sigourney St., Hartford, CT

Product Manufactured/Service Rendered:

Name: MariGrace Harkins

Company: EnviroMed Services, Inc.

Mailing Address: 470 Mundock Ave

City, State, Zip: Meriden, CT 06450

Phone No: (203) 238-4846

☐ Phone Results

Fax No: (203) 238-4243

☒ Fax Results

Email:

☐ Email Results

Sampling Location: 25 Sigourney St., Hartford, CT

Sampling Media:

Sampling Method:

CHAIN OF CUSTODY

Collected by (print): M. Harkins / S. Arana

Collector's Signature: M. Harkins

Relinquished by:

Date/Time

Received by:

Date/Time

Relinquished by:

Date/Time

Received by:

Date/Time

Method of Shipment:

Received at Lab by: Sam M. E. Fleury

Date/Time

10-2-02

Authorized by:

(signature required)

Date:

Sample Condition Upon Receipt: ☒ Acceptable ☐ Unacceptable

EHL SAMPLE NO. (Lab Use Only)	SAMPLE CONTAINER NO.	Media Type	ANALYSIS DESIRED A 3 sample minimum of 30 min. analysis is less than 2 of each sample analysis is requested.	NOTES (Including sampling date, location and elevation, Other compound present, etc.)	SAMPLING RATE (liters/min)	SAMPLING TIME			AIR SAMPLE VOLUME (liters)
						Start	End	Total Time (min)	
✓	S1		SO ₂	Fresh Air Intake	0.1407	658	11"	253	35.6
✓	S2			17" FI - Conf Rm	0.1546	711	1159	262	40.5
✓	S3			17" FI - Elev Lobby	0.1641	728	1124	236	38.7
✓	S4			0/S Main Ent	0.1645	740	1144	244	40.1
✓	S5			6" FI North	0.1919	752	1159	247	47.4
✓	S6			6" FI - Elev Lobby	0.1645	801	1152	231	38.0
✓	S7		↓	BLANK					
✓	N1		Nitrogen Dioxide	Fresh Air Intake	0.1052	658	11"	253	26.6
✓	N2			17" FI - Conf Rm	0.1811	711	1159	262	47.4
✓	N3			17" FI - Elev Lobby	0.2045	728	1124	236	48.3
✓	N4			0/S Main Ent	0.1780	740	1144	244	43.4
✓	N5			6" FI North	0.1737	752	1159	247	42.9
✓	N6			6" FI - Elev Lobby	0.1855	801	1152	231	42.8
✓	N7		↓	BLANK					

FOR LAB NOTES ONLY:

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Appendix C
Sampling Pump Calibration Log

SAMPLING PUMP CALCULATION LOG USING GILBATOR PRIMARY CALCULATOR

Pump#	Make and SN#	Date/ Infills	Pro	Sampling Flowrate 2	Sampling Flowrate 3	Average (l/min)	Date/ Infills	Post	Sampling Flowrate 2	Sampling Flowrate 3	Average (l/min)	Average (l/min)	Sampling Medium
2A	SAC 5249535	10/16/2 SEA	3386	3387	0.3385	0.3388	10/16/2 SEA	0.3385	0.3265	0.3270	0.3269	0.3329	DNPH
16A	SAC 5220471	10/16/2 SEA	2894	0.2902	0.2901	0.2899	10/16/2 SEA	0.2893	0.2592	0.2594	0.2589	0.2591	DNPH
252	SAC 6322961	10/16/2 SEA	2903	2918	0.2974	0.2898	10/16/2 SEA	0.3002	0.3045	0.3082	0.3043	0.2971	DNPH
217	SAC 6320600	10/16/2 SEA	3965	3973	3979	0.3972	10/16/2 SEA	0.3976	0.3581	0.3554	0.3580	0.3576	DNPH
283	SAC 5322100	10/16/2 SEA	3033	3086	3067	0.3082	10/16/2 SEA	0.3086	0.3521	0.3535	0.3521	0.3537	DNPH
282	SAC 6321111	10/16/2 SEA	2838	2838	2840	0.2839	10/16/2 SEA	0.2867	0.2871	0.2873	0.2871	0.2888	DNPH
16B	SAC 62044	10/16/2 SEA	0.1774	0.1775	0.1778	0.1775	10/16/2 SEA	0.1801	0.1791	0.1788	0.1784	0.1780	TEAM
2B	SAC 8329535	10/16/2 SEA	0.1046	0.1046	0.1046	0.1046	10/16/2 SEA	0.1057	0.1056	0.1056	0.1057	0.1052	TEAM
2684	SAC 632838	10/16/2 SEA	0.1543	0.2000	0.2000	0.2000	10/16/2 SEA	0.2086	0.2085	0.2082	0.2085	0.2045	TEAM
2014	SAC 632013	10/16/2 SEA	0.1723	0.1725	0.1727	0.1725	10/16/2 SEA	0.1747	0.1745	0.1780	0.1745	0.1735	TEAM
2784	SAC 632081	10/16/2 SEA	0.1780	0.1787	0.1788	0.1788	10/16/2 SEA	0.1839	0.1836	0.1836	0.1837	0.1811	TEAM
2994	SAC 632560	10/16/2 SEA	0.1896	0.1897	0.1898	0.1897	10/16/2 SEA	0.1917	0.1916	0.1916	0.1917	0.1887	TEAM
254B	SAC 6322900	10/16/2 SEA	0.1040	0.1043	0.1045	0.1043	10/16/2 SEA	0.1046	0.1046	0.1049	0.1047	0.1048	PTE + Answer
241B	SAC 6322013	10/16/2 SEA	0.1915	0.1916	0.1918	0.1917	10/16/2 SEA	0.1916	0.1920	0.1923	0.1920	0.1919	PTE + Answer
264B	SAC 632838	10/16/2 SEA	0.1038	0.1041	0.1044	0.1041	10/16/2 SEA	0.1037	0.1039	0.1042	0.1040	0.1041	PTE + Answer
278B	SAC 632581	10/16/2 SEA	0.1535	0.1540	0.1540	0.1540	10/16/2 SEA	0.1587	0.1582	0.1583	0.1582	0.1574	PTE + Answer
2C	SAC 5329535	10/16/2 SEA	0.1406	0.1391	0.1391	0.1423	10/16/2 SEA	0.1393	0.1390	0.1390	0.1391	0.1407	PTE + Answer
16C	SAC 5220471	10/16/2 SEA	0.1046	0.1045	0.1045	0.1045	10/16/2 SEA	0.1047	0.1046	0.1042	0.1045	0.1045	PTE + Answer
4	SAC 5329708	10/16/2 SEA	1.464	1.467	1.468	1.466	10/16/2 SEA	0.9579	0.9042	0.902	0.9025	1.2144	MC Re-weigh Cyclone
298	SAC 632587	10/16/2 SEA	2.082	2.084	2.084	2.083	10/16/2 SEA	2.087	2.064	2.069	2.065	2.073	MC Re-weigh Cyclone

SEAWATER PUMP CALIBRATION LOG USING GILBERTON PRIMARY CALIBRATION

Pump	Make and S/N	Date/ Initials	Pto	Sampling Flowrate (LPM)	Average (LPM)	Date/ Initials	Post	Sampling Flowrate (LPM)	Average (LPM)	Average (LPM)	Sampling Medium
				1	2	3		1	2	3	
297	S&C C32272	12/16/02 S&A	1/106	1.168	1.168	1.168	1.070	1.069	1.073	1.071	GFF
316	S&C C32030	12/11/02 S&A	0.986	0.982	0.982	0.983	0.9649	0.9668	0.9692	0.9670	GFF
202	S&C C32288	12/11/02 S&A	1.123	1.178	1.178	1.176	1.149	1.151	1.153	1.153	GFF
267	S&C C32108	12/11/02 S&A	1.232	1.235	1.234	1.234	1.205	1.205	1.208	1.206	GFF
270	S&C C32107	12/11/02 S&A	1.133	1.136	1.137	1.136	1.115	1.119	1.121	1.118	GFF
318	S&C C32105	12/11/02 S&A	1.274	1.275	1.279	1.276	1.271	1.274	1.276	1.273	GFF